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THIS MESSAGE HAS 39 PAGES INCLUDING THIS SHEET

TO: COMMISSIONER OF PATENTS

FAX NO.: (571) 273-8300

FROM: KIN-WAH TONG, ESQ.

DATE: FEBRUARY 15, 2006

MATTER: U.S. SERIAL NO.: 09/900,618 FILED JULY 6, 2001

DOCKET NO.: SR1-010A (PACK/4380-2A)

APPLICANT: AMBATIPUDI R. SASTRY, ET AL.

THE FOLLOWING HAS BEEN RECEIVED IN THE U.S. PATENT AND TRADEMARK OFFICE ON THE DATE OF THIS FACSIMILE:

_____ PETITION
_____ DISCLOSURE STATEMENT & PTO-1449
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X APPEAL BRIEF
_____ REQUEST FOR EXTENSION OF TIME (2 COPIES)

X TRANSMITTAL LETTER (2 COPIES)
X FEE TRANSMITTAL (2 COPIES)
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X FACSIMILE TRANSMISSION CERTIFICATE DATED FEBRUARY 15, 2006
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437901-1

PTO/SB/21 (09-04)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission

Application Number	09/900,618
Filing Date	July 6, 2001
First Named Inventor	Ambatipudi R. Sastry, et al.
Art Unit	2666
Examiner Name	Harper, Kevin C.
Attorney Docket Number	SRI-010A (PACK/4380-2A)

ENCLOSURES *(check all that apply)*

- ☒ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
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- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below)*:

Facsimile Transmission

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm	Patterson and Sheridan, LLP		
Signature			
Printed Name	Kin-Wah Tong, Esq.		
Date	February 15, 2006	Reg. No.	39,400

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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL for FY 2006

☒ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT	($) 250

Complete if Known	
Application Number	09/900,818
Filing Date	07/06/2001
First Named Inventor	Ambatipudi R. Sastry, et al.
Examiner Name	Harper, Kevin C.
Art Unit	2666
Attorney Docket No.	SRI-010A (PACK/4380-2A)

METHOD OF PAYMENT (check all that apply)

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee($)	Fee($)	Fee($)	Fee($)	Fee($)	Fees Paid ($)
Utility	300	150	500	250	200	100	_____
Design	200	100	100	50	130	65	_____
Plant	200	100	300	150	160	80	_____
Reissue	300	150	500	250	600	300	_____
Provisional	200	100	0	0	0	0	_____

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims	Extra Claims	Fee($)	Fee Paid ($)
_____ -20 or HP=	_____	x _____	= _____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims	Extra Claims	Fee($)	Fee Paid ($)
_____ - 3 or HP=	_____	x _____	= _____

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee ($)	Fee Paid ($)
_____ - 100 =	_____ / 50 =	_____ (round up to a whole number) x		= _____

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee (no small entity discount)	_____
Other (e.g., late filing surcharge) : Filing a brief in support of an appeal	250

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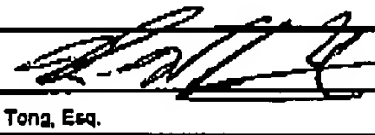
Signature		Registration No. (Attorney/Agent) 39,400	Telephone (732) 530-9404
Name (Print/Type)	Kin-Wah Tong, Esq.		Date February 15, 2006

PATENT
Atty. Dkt. No. SRI-010A(PACK 4380-2A)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of: Sastry, et al.	§	
Serial No.: 09/900,618	§	Group Art Unit: 2666
Confirmation No.: 6069	§	Examiner: Harper, Kevin C.
Filed: July 6, 2001	§	
For: A PER HOP BEHAVIOR FOR DIFFERENTIATED SERVICES IN MOBILE AD HOC WIRELESS NETWORKS	§	

MAIL STOP APPEAL BRIEF - PATENTS
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February 15, 2006
Date

Signature

Dear Sir:

APPEAL BRIEF

Appellants submit this Appeal Brief to the Board of Patent Appeals and Interferences on appeal from the decision of the Examiner of Group Art Unit 2666 dated August 16, 2005, finally rejecting claims 1-14 and 17-21. Please charge the fee of $250.00 for filing this brief and all other fees that may be required to make this Brief timely and acceptable to the Patent Office to Deposit Account No. 20-0782.

REAL PARTY IN INTEREST

The real party in interest is SRI International, Inc., located in Menlo Park, CA.

RELATED APPEALS AND INTERFERENCES

The Appellants know of no related appeals or interferences that might directly affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 1-14 and 17-21 are pending in the application. Original claims 15 and 16 have been cancelled. Claims 1-14 and 17-21 were originally presented in the application. Claims 1-14 and 17-21 stand rejected in view of several references as discussed below. The rejection of claims 1-14 and 17-21 based on the cited references is appealed. The pending claims are shown in the attached Appendix.

STATUS OF AMENDMENTS

An amendment to claims 1, 17 and 20 was filed on June 1, 2005 in response to a non-final rejection dated February 1, 2005. A second amendment to claims 1, 17 and 20 was filed on October 27, 2005 in response to a final rejection issued on August 16, 2005. The amendments in the October 27, 2005 response were entered and the final rejection was affirmed by an Advisory Action dated November 30, 2005, from which Appellants now appeal.

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention provides a system and method for providing a per hop behavior for forwarding packets in multi-hop mobile networks. In the embodiment of independent claim 1, a method generally comprises, in a network comprising a plurality of router nodes connected in the network by communication links, defining 50 a plurality of classes, each of the classes representing an aggregate behavior of packets. (Pg. 10, Line 16 – Pg. 11, Line 13; Pg. 19, Line 4; Fig. 2). The method then allocates 54 to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth. (Pg. 13, Lines 1-11; Pg. 19, Lines 4-6; Fig. 2). Finally, the method assures 58 each of the classes a minimum allocation of the available bandwidth for

transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth, wherein at least one of the nominal departure rate or the minimum allocation is dynamically changeable. (Pg. 18, Lines 16-22; Pg. 19, Lines 6-7; Fig. 2).

In the embodiment of independent claim 17, a router node 12, in a network, that supports differentiated services provides a classifier defining a plurality of classes, each of the classes representing an aggregate behavior of packets (Pg. 11, Lines 15-21), an allocater allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth is substantially operating at the nominal bandwidth (Pg. 13, Lines 1-11), and a rate prioritizer assigning each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth off the channel is operating at less than the nominal bandwidth, wherein at least one of the nominal departure rate or the minimum allocation is dynamically changeable (Pg. 15, Lines 1-10).

In the embodiment of independent claim 20, an article of manufacture having computer-readable program means embodied thereon for providing quality of service assurances for transmitting packets over a channel that transmits at least a nominal bandwidth is provided comprising a computer-readable means for defining a plurality of classes, each of the classes representing an aggregate behavior of packets (Pg. 11, Lines 15-21; Pg. 33, Line 16 – Pg. 17, Line 3), a computer-readable means for allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth (Pg. 13, Lines 1-11; Pg. 33, Line 16 – Pg. 17, Line 3), and a computer-readable means for assuring each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth, wherein at least one of the nominal departure rate or the minimum allocation is dynamically changeable (Pg. 18, Lines 16-22; Pg. 33, Line 16 – Pg. 17, Line 3).

GROUNDS OF REJECTION

1. Claims 1-3, 5-9 and 13-21 stand rejected under 35 U.S.C. §102(e) as being

anticipated by *Li, et al.* (U.S. Patent No. 6,738,819, hereinafter "*Li*").

2. Claim 4 stands rejected under 35 U.S.C. §103(a) as being obvious over *Li* in view of *Nandy, et al.* (U.S. Patent No. 6,646,988, hereinafter "*Nandy*").

3. Claims 10-12 stand rejected under 35 U.S.C. §103(a) as being obvious over *Li* in view of *Aatresh* (U.S. Patent No. 6,067,301, hereinafter "*Aatresh*").

THE REFERENCES

The Examiner relies on the following references:

Author	Publication Title or Reference number	Issue Date
Li, et al.	U.S. Patent No. 6,738,819	May 18, 2004
Nandy et al.	U.S. Patent No. 6,646,988	November 11, 2003
Aatresh	U.S. Patent No. 6,067,301	May 23, 2000

BRIEF DESCRIPTION OF THE REFERENCES

U.S. Patent No. 6,738,819 to *Li* teaches a method and apparatus for assuring Quality of Service (QoS) over links of an Internet Protocol (IP) network with differentiated services (DiffServ) capabilities. (See *Li*, column 4, lines 8-18). Specifically, *Li* teaches a method whereby, for each link, a finite amount of bandwidth is allocated among a plurality of defined packet service classes (*e.g.*, "best effort", "expedited forwarding", "assured forwarding", etc.). (See *Id.* at lines 25-31, lines 58-60). To meet delay or loss of packet objectives, the capacity allocated to a particular service class is utilized up to a pre-determined maximum allowable capacity. (See *Id.* at lines 35-39). For a service class with tight requirements on delay and loss, this maximum allowable capacity is less than the actual bandwidth allocated to the service class. (See *Id.* at lines 39-44). For a service class with looser or no such requirements, this maximum allowable capacity is closer to the actual bandwidth allocated to the service class. (See *Id.* at lines 44-47). Thus, in essence, a service class will almost never use 100% of its allocated bandwidth.

U.S. Patent No. 6,646,988 to *Nandy* teaches a method for bandwidth allocation in which each packet associated with an "out-of-profile" stream of traffic is assigned a drop precedence. (See *Nandy*, column 7, line 62 – column 8, line 44). An "out-of-profile" stream is one in which the stream traffic exceeds a target rate. (See *Id.*). The drop precedence is based on a plurality of factors (including a target rate for the corresponding packet) and defines a priority for dropping packets so-marked. (See *Id.*).

U.S. Patent No. 6,067,301 to *Aatresh* teaches a method for forwarding packets from contending queues of a multiport switch to an output of a finite bandwidth. The contending queues are prioritized according to the priorities of the packets being forwarded, and bandwidth is then allocated among the prioritized queues. (See *Aatresh*, Abstract). Any subsequently unconsumed bandwidth is redistributed on a priority basis (*e.g.*, starting with the highest-priority queue). (See *Id.*)

ARGUMENT

THE ISSUES UNDER 35 U.S.C. §102

A. 35 U.S.C. §102(e) – *Li*

1. Claim 1

The Examiner rejected claim 1 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Board's attention is directed to the fact that *Li* fails to teach, show or suggest a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, as recited by the Appellants' independent claim 1.

Specifically, Appellants' claim 1 recites:

> 1. In a network comprising a plurality of router nodes connected in the network by communication links, a method of providing quality of service assurances for transmitting packets over a channel that transmits at at least at a nominal bandwidth, the method comprising:
> defining a plurality of classes, each of the classes representing an aggregate behavior of packets;

allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth; and

assuring each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth,

wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable. (Emphasis added)

The Appellants' invention is directed to a per hop behavior for differentiated services in mobile ad hoc wireless networks. Conventional service models for assuring QoS tend to be inadequate for many applications, especially those implemented in wireless networks. In particular, the dynamic nature of wireless network topologies (*e.g.*, due to the mobility of the linked devices) and the peculiarities of signal propagation over wireless links (which tend to cause frequent changes to the states of the links) often cause a wireless network to be subject to higher data losses and more frequent bandwidth reallocations than traditional wired networks. Moreover, the scope of the well-known DiffServ mechanisms (*e.g.*, as defined by the Internet Engineering Task Force Differentiated Services Working Group) is largely directed to channels whose available bandwidth is somewhat predictable and addresses how to distribute the bandwidth that is available with some predictability. Accordingly, application of the DiffServ mechanisms to highly dynamic mobile networks, in which available bandwidth is difficult to predict, is problematic.

The Appellants' invention attempts to address this inadequacy by providing a per hop behavior for differentiated services in mobile ad hoc wireless networks. For example, in one embodiment, the Appellants provide a method whereby bandwidth for a link capable of transmission at a nominal bandwidth is allocated among a plurality of packet classes. (See Appellants' specification, pages 10-17). At any given time, the specific amount of bandwidth allocated to a given class depends on how much of the nominal bandwidth is being consumed. Thus, each class is associated with: (1) a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth (See Appellants' specification, page 13, lines 1-11); and (2) a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of

the channel is operating at less than the nominal bandwidth (See Appellants' specification, page 13, lines 12-19). Either or both of the nominal departure rate and the minimum allocation of the available bandwidth is dynamically changeable, such that it/they may be adjusted to compensate for changing bandwidth availability resulting from changing network topology (*e.g.*, changes in link conditions). (See Appellants' specification, page 15, line 20 – page 16, line 19). Thus, the Appellants' invention may be particularly well-suited for implementation in applications for wireless links and/or highly mobile networked devices.

By contrast, *Li* teaches a method in which a maximum allocation of bandwidth (admit limit) is measured for incoming requests. (See *Li*, column 5, lines 41-56). Thus, *Li* does not teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a nominal departure rate and/or a minimum bandwidth allocation for individual packet classes is dynamically changeable.

The Appellants respectfully submit that the Examiner has erroneously equated the allocated link bandwidth taught by *Li* with the Appellants' allocated nominal departure rate and erroneously equated the maximum allowable capacity taught by *Li* with the Appellants' minimum allocation of available bandwidth. Specifically, the Appellants submit that the nominal departure rate and the minimum allocation of bandwidth each represent a minimum amount or lower limit of bandwidth dedicated to a given class, depending on whether the associated link is operating under "normal" conditions or "degraded" conditions (*e.g.*, due to reduced resources) – a class will receive no less than this amount of bandwidth, but may receive more depending on resource availability. (See Appellants' specification, page 14 line 21 – page 15, line 2). The allocated link bandwidth and maximum allowable capacity taught by *Li* represent a maximum amount or upper limit of bandwidth dedicated to a given class, where the difference between the allocated link bandwidth and maximum allowable capacity reflects the tightness of delay and loss requirements for that class – a class can receive no more than this bandwidth, but may receive less depending on the class's requirements (See *Li*, column 5, lines 64-65: "A service request is accepted if the required bandwidth does not exceed the admit limit (AL)", emphasis added). Thus, *Li*

does not teach or suggest allocating a nominal departure rate or a minimum allocation of bandwidth, but at most teaches measuring a maximum allowable bandwidth.

The Examiner asserts in the Advisory Action that *Li* does, in fact, teach a minimum bandwidth assigned to a packet class; however, the Appellants respectfully disagree with the Examiner's characterization of the cited portions of *Li*.

In particular, the Examiner submits that the limitation of a minimum bandwidth assigned to a packet class is taught by *Li* at column 4, lines 31-34 and 40-41. Lines 31-34 describe how percentages of total link bandwidth are allocated to each service type (*e.g.*, " ... EF service is given a of the total link bandwidth, AF service is given b of the total link bandwidth, and BE service is assigned c of the total link bandwidth."). The Examiner equates the allocated percentages of total link bandwidth with the minimum bandwidth claimed by the Appellants.

However, the next portion of *Li* that the Examiner cites describes that "For services with tight requirement on data packet delay and loss such as [EF service], the maximum allowable capacity (R_{max}) will be lower than the allocated bandwidth a for this service ($R_{max} < a$) ... For services with loose or no requirements on delay and loss [*i.e.*, AF service], the maximum allowable capacity will be close to the actual allocated bandwidth b to this service ($R_{max} \approx b$)" (*Li*, colum 4, lines 40-47, emphasis added). Thus, this passage makes clear that *Li* is describing the allocation of a maximum amount or upper limit of bandwidth. That is, if the total link bandwidth allocations that *Li* describes in the first passage (*i.e.*, allocated bandwidths a, b, and c described at column 4, lines 31-34) were minimum allocations, then the maximum allowable capacity for a given service class could not be less than the allocated bandwidth a, b or c (*i.e.*, as in the case of $R_{max} < a$). Thus, the Appellants submit that the portions of *Li* that are cited by the Examiner support the Appellants' assertion that *Li* does not teach, show or suggest allocating a minimum bandwidth to a packet class, as claimed by the Appellants' independent claim 1.

However, even assuming that the Appellants' nominal departure rate/minimum allocation of bandwidth may be equated with *Li*'s allocated link bandwidth/maximum allowable capacity, *Li* still does not teach or suggest every limitation of the Appellants' claimed invention, because *Li* does not teach or suggest that the allocated link

bandwidth and/or maximum allowable capacity is dynamically changeable. The portions of *Li* that the Examiner cites to support this assertion at most teach that *Li* is capable of dynamically adjusting the amount of new traffic that the network is configured to accept, based on current utilization of allocated resources. That is, *Li* teaches identifying a link having the smallest remaining capacity (bandwidth) and updating a metric to reflect the value of this smallest remaining capacity (See *Li*, column 5, lines 45-52: "An AL [admit limit] block 44 records the smallest remaining capacity ... among all links ... Block 45 updates the AL block 44 with freshly measured smallest remaining capacity for the entire network ...", emphasis added). The Appellants respectfully submit that this is not the same as dynamically adjusting the per-class resource allocations themselves. Rather, it is merely taking a measurement and recording the measurement.

Therefore, the Appellants respectfully submit that independent claim 1 is clearly patentable and not anticipated by *Li*.

2. Claim 2

The Examiner rejected claim 2 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 2 is also not anticipated since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 2 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, wherein the step of assuring a minimum allocation to each of the classes comprises assigning a percentage to each of the classes that represents a minimum percentage of the available bandwidth that is allocated to that class, as set forth in claim

2. Thus, the Appellants respectfully submit that claim 2 is patentable under the provisions of 35 U.S.C. §102.

3. Claim 3

The Examiner rejected claim 3 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 3 is also not anticipated since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 3 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, wherein the minimum allocations assured to the classes are proportionally different than the nominal departure rates allocated to these classes, as set forth in claim 3. Thus, the Appellants respectfully submit that claim 3 is patentable under the provisions of 35 U.S.C. §102.

4. Claim 5

The Examiner rejected claim 5 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 5 is also not anticipated since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 5 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet

departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, wherein the nominal departure rate assigned to each of the classes by a given one of the router nodes is a percentage of a nominal bandwidth of an outgoing communication link of that router node, as set forth in claim 5. As such packets do not build up its queue. (See Appellants' specification, page 13, lines 9-11). Thus, the Appellants respectfully submit that claim 5 is patentable under the provisions of 35 U.S.C. §102.

5. Claim 6

The Examiner rejected claim 6 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 6 is also not anticipated since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 6 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, wherein a given router node has a plurality of outgoing communication links and the nominal departure rate allocated to a given class is different for the different outgoing communication links, as set forth in claim 6. The individual allocations can take into consideration such heterogeneity to reduce the burstiness in traffic patterns and adequate buffers to smooth out the short term fluctuations. (See Appellants' specification, page 18, lines 11-13). Thus, the Appellants respectfully submit that claim 6 is patentable under the provisions of 35 U.S.C. §102.

6. Claim 7

The Examiner rejected claim 7 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 7 is also not anticipated since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 7 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, wherein the nominal departure rate allocated to a given class is different for different router nodes, as set forth in claim 7. The individual allocations can take into consideration such heterogeneity to reduce the burstiness in traffic patterns and adequate buffers to smooth out the short term fluctuations. (See Appellants' specification, page 18, lines 11-13). Thus, the Appellants respectfully submit that claim 7 is patentable under the provisions of 35 U.S.C. §102.

7. Claim 8

The Examiner rejected claim 8 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 8 is also not anticipated since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 8 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, wherein a given router node has a plurality of outgoing communication links and the nominal departure rate together with the assured minimum allocation allocated to a given class is different for the different outgoing communication links, as

set forth in claim 8. The individual allocations can take into consideration such heterogeneity to reduce the burstiness in traffic patterns and adequate buffers to smooth out the short term fluctuations. (See Appellants' specification, page 18, lines 11-13). Thus, the Appellants respectfully submit that claim 8 is patentable under the provisions of 35 U.S.C. §102.

8. Claim 9

The Examiner rejected claim 9 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 9 is also not anticipated since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 9 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, wherein the nominal departure rate together with the minimum allocation allocated to a given class is different for different router nodes, as set forth in claim 9. The individual allocations can take into consideration such heterogeneity to reduce the burstiness in traffic patterns and adequate buffers to smooth out the short term fluctuations. (See Appellants' specification, page 18, lines 11-13). Thus, the Appellants respectfully submit that claim 9 is patentable under the provisions of 35 U.S.C. §102.

9. Claim 13

The Examiner rejected claim 13 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 13 is also not anticipated

since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 13 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, and further comprising assigning scheduling priorities to the classes based on a criterion, as set forth in claim 13. Thus, the Appellants respectfully submit that claim 13 is patentable under the provisions of 35 U.S.C. §102.

10. Claim 14

The Examiner rejected claim 14 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 14 is also not anticipated since the claim depends indirectly from claim 1 and recites additional features of the present invention. Thus, claim 14 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, wherein the criterion is a delay that each class can tolerate, as set forth in claim 14. Thus, the Appellants respectfully submit that claim 14 is patentable under the provisions of 35 U.S.C. §102.

11. Claim 17

The Examiner rejected claim 17 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Board's attention is directed to the fact that *Li* fails to teach, show or suggest a router node for transmitting packets wherein at least one of: a packet class's nominal

packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, as recited by the Appellants' independent claim 17.

Specifically, Appellants' claim 17 recites:

> 17. In a network, a router node that supports differentiated services, the router node comprising:
> a classifier defining a plurality of classes, each of the classes representing an aggregate behavior of packets;
> an allocater allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of a channel that transmits at at least at a nominal bandwidth is substantially operating at the nominal bandwidth; and
> a rate prioritizer assigning each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth,
> wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable. (Emphasis added)

The Appellants' invention is directed to a per hop behavior for differentiated services in mobile ad hoc wireless networks. Conventional service models for assuring QoS tend to be inadequate for many applications, especially those implemented in wireless networks. In particular, the dynamic nature of wireless network topologies (*e.g.*, due to the mobility of the linked devices) and the peculiarities of signal propagation over wireless links (which tend to cause frequent changes to the states of the links) often cause a wireless network to be subject to higher data losses and more frequent bandwidth reallocations than traditional wired networks. Moreover, the scope of the well-known DiffServ mechanisms (*e.g.*, as defined by the Internet Engineering Task Force Differentiated Services Working Group) is largely directed to channels whose available bandwidth is somewhat predictable and addresses how to distribute the bandwidth that is available with some predictability. Accordingly, application of the DiffServ mechanisms to highly dynamic mobile networks, in which available bandwidth is difficult to predict, is problematic.

The Appellants' invention attempts to address this inadequacy by providing a per hop behavior for differentiated services in mobile ad hoc wireless networks. For example, in one embodiment, the Appellants provide a method whereby bandwidth for a link capable of transmission at a nominal bandwidth is allocated among a plurality of

packet classes. (See Appellants' specification, pages 10-17). At any given time, the specific amount of bandwidth allocated to a given class depends on how much of the nominal bandwidth is being consumed. Thus, each class is associated with: (1) a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth (See Appellants' specification, page 13, lines 1-11); and (2) a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth (See Appellants' specification, page 13, lines 12-19). Either or both of the nominal departure rate and the minimum allocation of the available bandwidth is dynamically changeable, such that it/they may be adjusted to compensate for changing bandwidth availability resulting from changing network topology (*e.g.*, changes in link conditions). (See Appellants' specification, page 15, line 20 – page 16, line 19). Thus, the Appellants' invention may be particularly well-suited for implementation in applications for wireless links and/or highly mobile networked devices.

By contrast, *Li* teaches a method in which a maximum allocation of bandwidth (admit limit) is measured for incoming requests. (See *Li*, column 5, lines 41-56). Thus, *Li* does not teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a nominal departure rate and/or a minimum bandwidth allocation for individual packet classes is dynamically changeable.

The Appellants respectfully submit that the Examiner has erroneously equated the allocated link bandwidth taught by *Li* with the Appellants' allocated nominal departure rate and erroneously equated the maximum allowable capacity taught by *Li* with the Appellants' minimum allocation of available bandwidth. Specifically, the Appellants submit that the nominal departure rate and the minimum allocation of bandwidth each represent a minimum amount or lower limit of bandwidth dedicated to a given class, depending on whether the associated link is operating under "normal" conditions or "degraded" conditions (*e.g.*, due to reduced resources) – a class will receive no less than this amount of bandwidth, but may receive more depending on resource availability. (See Appellants' specification, page 14 line 21 – page 15, line 2). The allocated link bandwidth and maximum allowable capacity taught by *Li* represent a

maximum amount or upper limit of bandwidth dedicated to a given class, where the difference between the allocated link bandwidth and maximum allowable capacity reflects the tightness of delay and loss requirements for that class – a class can receive no more than this bandwidth, but may receive less depending on the class's requirements (See *Li*, column 5, lines 64-65: "A service request is accepted if the required bandwidth does not exceed the admit limit (AL)", emphasis added). Thus, *Li* does not teach or suggest allocating a nominal departure rate or a minimum allocation of bandwidth, but at most teaches measuring a maximum allowable bandwidth.

The Examiner asserts in the Advisory Action that *Li* does, in fact, teach a minimum bandwidth assigned to a packet class; however, the Appellants respectfully disagree with the Examiner's characterization of the cited portions of *Li*.

In particular, the Examiner submits that the limitation of a minimum bandwidth assigned to a packet class is taught by *Li* at column 4, lines 31-34 and 40-41. Lines 31-34 describe how percentages of total link bandwidth are allocated to each service type (*e.g.*, " ... EF service is given a of the total link bandwidth, AF service is given b of the total link bandwidth, and BE service is assigned c of the total link bandwidth."). The Examiner equates the allocated percentages of total link bandwidth with the minimum bandwidth claimed by the Appellants.

However, the next portion of *Li* that the Examiner cites describes that "For services with tight requirement on data packet delay and loss such as [EF service], the maximum allowable capacity (R_{max}) will be lower than the allocated bandwidth a for this service ($R_{max} < a$) ... For services with loose or no requirements on delay and loss [*i.e.*, AF service], the maximum allowable capacity will be close to the actual allocated bandwidth b to this service ($R_{max} \approx b$)" (*Li*, colum 4, lines 40-47, emphasis added). Thus, this passage makes clear that *Li* is describing the allocation of a maximum amount or upper limit of bandwidth. That is, if the total link bandwidth allocations that *Li* describes in the first passage (*i.e.*, allocated bandwidths a, b, and c described at column 4, lines 31-34) were minimum allocations, then the maximum allowable capacity for a given service class could not be less than the allocated bandwidth a, b or c (*i.e.*, as in the case of $R_{max} < a$). Thus, the Appellants submit that the portions of *Li* that are cited by the Examiner support the Appellants' assertion that *Li* does not teach, show or

suggest allocating a minimum bandwidth to a packet class, as claimed by the Appellants' independent claim 17.

However, even assuming that the Appellants' nominal departure rate/minimum allocation of bandwidth may be equated with *Li*'s allocated link bandwidth/maximum allowable capacity, *Li* still does not teach or suggest every limitation of the Appellants' claimed invention, because *Li* does not teach or suggest that the allocated link bandwidth and/or maximum allowable capacity is dynamically changeable. The portions of *Li* that the Examiner cites to support this assertion at most teach that *Li* is capable of dynamically adjusting the amount of new traffic that the network is configured to accept, based on current utilization of allocated resources. That is, *Li* teaches identifying a link having the smallest remaining capacity (bandwidth) and updating a metric to reflect the value of this smallest remaining capacity (See *Li*, column 5, lines 45-52: "An AL [admit limit] block 44 records the smallest remaining capacity ... among all links ... Block 45 updates the AL block 44 with freshly measured smallest remaining capacity for the entire network ...", emphasis added). The Appellants respectfully submit that this is not the same as dynamically adjusting the per-class resource allocations themselves. Rather, it is merely taking a measurement and recording the measurement.

Therefore, the Appellants respectfully submit that independent claim 17 is clearly patentable and not anticipated by *Li*.

12. Claim 18

The Examiner rejected claim 18 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 17. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 17, dependent claim 18 is also not anticipated since the claim depends directly from claim 17 and recites additional features of the present invention. Thus, claim 18 should be deemed patentable for at least the reasons stated above with respect to independent claim 17.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a router node for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, and further comprising a plurality of outgoing communication links, and wherein the nominal departure rate allocated to a given class is different for different outgoing communication links, as set forth in claim 18. The individual allocations can take into consideration such heterogeneity to reduce the burstiness in traffic patterns and adequate buffers to smooth out the short term fluctuations. (See Appellants' specification, page 18, lines 11-13). Thus, the Appellants respectfully submit that claim 18 is patentable under the provisions of 35 U.S.C. §102.

13. Claim 19

The Examiner rejected claim 19 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 17. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 17, dependent claim 19 is also not anticipated since the claim depends directly from claim 17 and recites additional features of the present invention. Thus, claim 19 should be deemed patentable for at least the reasons stated above with respect to independent claim 17.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a router node for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, and further comprising a plurality of outgoing communication links, and wherein the nominal departure rate together with the assured minimum allocation allocated to a given class is different for different outgoing communication links, as set forth in claim 19. The individual allocations can take into consideration such heterogeneity to reduce the burstiness in traffic patterns and adequate buffers to smooth out the short term fluctuations. (See Appellants' specification, page 18, lines 11-13). Thus, the Appellants respectfully submit that claim 19 is patentable under the provisions of 35 U.S.C. §102.

14. Claim 20

The Examiner rejected claim 20 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Board's attention is directed to the fact that *Li* fails to teach, show or suggest an article of manufacture having computer-readable program means embodied thereon for providing quality of service assurances for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, as recited by the Appellants' independent claim 20.

Specifically, Appellants' claim 20 recites:

> 20. An article of manufacture having computer-readable program means embodied thereon for providing quality of service assurances for transmitting packets over a channel that transmits at at least at a nominal bandwidth, the article comprising:
>
> computer-readable means for defining a plurality of classes, each of the class classes representing an aggregate behavior of packets;
>
> computer-readable means for allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth; and
>
> computer-readable means for assuring each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth,
>
> wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable. (Emphasis added)

The Appellants' invention is directed to a per hop behavior for DiffServ in mobile ad hoc wireless networks. Conventional service models for assuring QoS tend to be inadequate for many applications, especially those implemented in wireless networks. In particular, the dynamic nature of wireless network topologies (*e.g.*, due to the mobility of the linked devices) and the peculiarities of signal propagation over wireless links (which tend to cause frequent changes to the states of the links) often cause a wireless network to be subject to higher data losses and more frequent bandwidth reallocations than traditional wired networks. Moreover, the scope of the well-known DiffServ mechanisms (*e.g.*, as defined by the Internet Engineering Task Force Differentiated

Services Working Group) is largely directed to channels whose available bandwidth is somewhat predictable and addresses how to distribute the bandwidth that is available with some predictability. Accordingly, application of the DiffServ mechanisms to highly dynamic mobile networks, in which available bandwidth is difficult to predict, is problematic.

The Appellants' invention attempts to address this inadequacy by providing a per hop behavior for differentiated services in mobile ad hoc wireless networks. For example, in one embodiment, the Appellants provide a method whereby bandwidth for a link capable of transmission at a nominal bandwidth is allocated among a plurality of packet classes. (See Appellants' specification, pages 10-17). At any given time, the specific amount of bandwidth allocated to a given class depends on how much of the nominal bandwidth is being consumed. Thus, each class is associated with: (1) a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth (See Appellants' specification, page 13, lines 1-11); and (2) a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth (See Appellants' specification, page 13, lines 12-19). Either or both of the nominal departure rate and the minimum allocation of the available bandwidth is dynamically changeable, such that it/they may be adjusted to compensate for changing bandwidth availability resulting from changing network topology (*e.g.*, changes in link conditions). (See Appellants' specification, page 15, line 20 – page 16, line 19). Thus, the Appellants' invention may be particularly well-suited for implementation in applications for wireless links and/or highly mobile networked devices.

By contrast, *Li* teaches a method in which a maximum allocation of bandwidth (admit limit) is measured for incoming requests. (See *Li*, column 5, lines 41-56). Thus, *Li* does not teach, show or suggest a method for attaining per-hop behavior for a plurality of classes of packet traffic in which a nominal departure rate and/or a minimum bandwidth allocation for individual packet classes is dynamically changeable.

The Appellants respectfully submit that the Examiner has erroneously equated the allocated link bandwidth taught by *Li* with the Appellants' allocated nominal

departure rate and erroneously equated the maximum allowable capacity taught by *Li* with the Appellants' minimum allocation of available bandwidth. Specifically, the Appellants submit that the nominal departure rate and the minimum allocation of bandwidth each represent a minimum amount or lower limit of bandwidth dedicated to a given class, depending on whether the associated link is operating under "normal" conditions or "degraded" conditions (*e.g.*, due to reduced resources) – a class will receive no less than this amount of bandwidth, but may receive more depending on resource availability. (See Appellants' specification, page 14 line 21 – page 15, line 2). The allocated link bandwidth and maximum allowable capacity taught by *Li* represent a maximum amount or upper limit of bandwidth dedicated to a given class, where the difference between the allocated link bandwidth and maximum allowable capacity reflects the tightness of delay and loss requirements for that class – a class can receive no more than this bandwidth, but may receive less depending on the class's requirements (See *Li*, column 5, lines 64-65: "A service request is accepted if the required bandwidth does not exceed the admit limit (AL)", emphasis added). Thus, *Li* does not teach or suggest allocating a nominal departure rate or a minimum allocation of bandwidth, but at most teaches measuring a maximum allowable bandwidth.

The Examiner asserts in the Advisory Action that *Li* does, in fact, teach a minimum bandwidth assigned to a packet class; however, the Appellants respectfully disagree with the Examiner's characterization of the cited portions of *Li*.

In particular, the Examiner submits that the limitation of a minimum bandwidth assigned to a packet class is taught by *Li* at column 4, lines 31-34 and 40-41. Lines 31-34 describe how percentages of total link bandwidth are allocated to each service type (*e.g.*, " ... EF service is given a of the total link bandwidth, AF service is given b of the total link bandwidth, and BE service is assigned c of the total link bandwidth."). The Examiner equates the allocated percentages of total link bandwidth with the minimum bandwidth claimed by the Appellants.

However, the next portion of *Li* that the Examiner cites describes that "For services with tight requirement on data packet delay and loss such as [EF service], the maximum allowable capacity (R_{max}) will be lower than the allocated bandwidth a for this service ($R_{max} < a$) ... For services with loose or no requirements on delay and loss [*i.e.*,

AF service], the maximum allowable capacity will be close to the actual allocated bandwidth b to this service ($R_{max} \approx b$)" (*Li*, colum 4, lines 40-47, emphasis added). Thus, this passage makes clear that *Li* is describing the allocation of a maximum amount or upper limit of bandwidth. That is, if the total link bandwidth allocations that *Li* describes in the first passage (*i.e.*, allocated bandwidths a, b, and c described at column 4, lines 31-34) were minimum allocations, then the maximum allowable capacity for a given service class could not be less than the allocated bandwidth a, b or c (*i.e.*, as in the case of $R_{max} < a$). Thus, the Appellants submit that the portions of *Li* that are cited by the Examiner support the Appellants' assertion that *Li* does not teach, show or suggest allocating a minimum bandwidth to a packet class, as claimed by the Appellants' independent claim 20.

However, even assuming that the Appellants' nominal departure rate/minimum allocation of bandwidth may be equated with *Li*'s allocated link bandwidth/maximum allowable capacity, *Li* still does not teach or suggest every limitation of the Appellants' claimed invention, because *Li* does not teach or suggest that the allocated link bandwidth and/or maximum allowable capacity is dynamically changeable. The portions of *Li* that the Examiner cites to support this assertion at most teach that *Li* is capable of dynamically adjusting the amount of new traffic that the network is configured to accept, based on current utilization of allocated resources. That is, *Li* teaches identifying a link having the smallest remaining capacity (bandwidth) and updating a metric to reflect the value of this smallest remaining capacity (See *Li*, column 5, lines 45-52: "An AL [admit limit] block 44 records the smallest remaining capacity ... among all links ... Block 45 updates the AL block 44 with freshly measured smallest remaining capacity for the entire network ...", emphasis added). The Appellants respectfully submit that this is not the same as dynamically adjusting the per-class resource allocations themselves. Rather, it is merely taking a measurement and recording the measurement.

Therefore, the Appellants respectfully submit that independent claim 20 is clearly patentable and not anticipated by *Li*.

15. Claim 21

The Examiner rejected claim 21 in the Final Office Action under 35 U.S.C. 102 as being anticipated by *Li*. The rejection is respectfully traversed.

The Appellants submit that *Li* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* does not anticipate the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 21 is also not anticipated since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 21 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that *Li* does not teach the novel concept of a method for transmitting packets wherein at least one of: a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth is dynamically changeable, and further comprising dynamically changing said at least one of the nominal departure rate and the minimum allocation in response to a change in a condition of at least one of said communication links, as set forth in claim 21. By dynamically changing at least one of the nominal departure rate and the minimum allocation in response to a change in a condition of at least one of said communication links, each class can receive less than its nominal departure rate, but always greater than or equal to its allocated rate priority percentage of the actual available bandwidth. (See Appellants' specification, page 15, line 21 – page 16, line 2). Thus, the Appellants respectfully submit that claim 21 is patentable under the provisions of 35 U.S.C. §102.

THE ISSUES UNDER 35 U.S.C. §103

A. 35 U.S.C. §103(a) – *Li* in view of *Nandy*

1. Claim 4

The Examiner rejected claim 4 in the Final Office Action under 35 U.S.C. 103 as being obvious over *Li* in view of *Nandy*. The rejection is respectfully traversed.

The teachings of *Li* and *Nandy* have been discussed above. As discussed, *Li* fails to teach, show or suggest a method for transmitting packets wherein one or both of a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth are dynamically changeable, as positively recited by Appellants'

independent claim 1. *Nandy* similarly fails to teach or suggest dynamically adjusting one or both of a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth; thus, *Nandy* does not bridge the gap in the teachings of *Li*. Therefore, the Appellants submit that for at least the reasons set forth above, independent claim 1 fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

Since *Li* in view of *Nandy* does not make obvious the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 4 is also not made obvious since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 4 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that the combination of *Li* and *Nandy* does not teach the novel concept of a method for transmitting packets wherein one or both of a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth are dynamically changeable, and further comprising establishing a drop precedence for each of the classes to determine a priority for dropping packets of that class, as set forth in claim 4. Establishing drop precedence assures better treatment for more important traffic. (See Appellants' specification, page 19, line 10). Thus, the Appellants respectfully submit that claim 4 is patentable under the provisions of 35 U.S.C. §103.

B. 35 U.S.C. §103(a) – *Li* in view of *Aatresh*

1. Claim 10

The Examiner rejected claim 10 in the Final Office Action under 35 U.S.C. 103 as being obvious over *Li* in view of *Aatresh*. The rejection is respectfully traversed.

The teachings of *Li* and *Aatresh* have been discussed above. As discussed, *Li* fails to teach, show or suggest a method for transmitting packets wherein one or both of a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth are dynamically changeable, as positively recited by Appellants' independent claim 1. *Aatresh* similarly fails to teach or suggest dynamically adjusting one or both of a packet class's nominal packet departure rate and the class's minimum

allocation of available bandwidth; thus, *Aatresh* does not bridge the gap in the teachings of *Li*. Therefore, the Appellants submit that for at least the reasons set forth above, independent claim 1 fully satisfies the requirements of 35 U.S.C. §103 and is patentable thereunder.

Since *Li* in view of *Aatresh* does not make obvious the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 10 is also not made obvious since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 10 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that the combination of *Li* and *Aatresh* does not teach the novel concept of a method for transmitting packets wherein one or both of a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth are dynamically changeable, and further comprising dropping packets from queues to limit the delay at a given router node, as set forth in claim 10. Dropping packets prevents excessive build up of packets within the queues and meets delay constraints. (See Appellants' specification, page 31, lines 4-6). Thus, the Appellants respectfully submit that claim 10 is patentable under the provisions of 35 U.S.C. §103.

2. Claim 11

The Examiner rejected claim 11 in the Final Office Action under 35 U.S.C. 103 as being obvious over *Li* in view of *Aatresh*. The rejection is respectfully traversed.

The Appellants submit that *Li* in view of *Aatresh* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* and *Aatresh* do not make obvious the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 11 is also not made obvious since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 11 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that the combination of *Li* and *Aatresh* does not teach the novel concept of a method for transmitting packets wherein one or both of a packet class's nominal packet departure rate and the class's minimum allocation of

available bandwidth are dynamically changeable, and further comprising attaining the minimum allocations assured to each of the service classes by providing an alternate route for packets of service classes in accordance with the rate priorities assigned to the service classes, as set forth in claim 11. Thus, the Appellants respectfully submit that claim 11 is patentable under the provisions of 35 U.S.C. §103.

3. Claim 12

The Examiner rejected claim 12 in the Final Office Action under 35 U.S.C. 103 as being obvious over *Li* in view of *Aatresh*. The rejection is respectfully traversed.

The Appellants submit that *Li* in view of *Aatresh* does not teach, show, or suggest all of the limitations of independent claim 1. Since *Li* and *Aatresh* do not make obvious the Appellants' invention as recited in Appellants' independent claim 1, dependent claim 12 is also not made obvious since the claim depends directly from claim 1 and recites additional features of the present invention. Thus, claim 12 should be deemed patentable for at least the reasons stated above with respect to independent claim 1.

Secondly, the Appellants contend that the combination of *Li* and *Aatresh* does not teach the novel concept of a method for transmitting packets wherein one or both of a packet class's nominal packet departure rate and the class's minimum allocation of available bandwidth are dynamically changeable, wherein at least one of the communication links is a wireless link, as set forth in claim 12. Thus, the Appellants respectfully submit that claim 12 is patentable under the provisions of 35 U.S.C. §103.

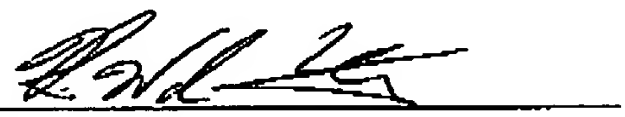
CONCLUSION

For the reasons advanced above, Appellant respectfully urges that the rejections of claims 1-14 and 17-21 as being unpatentable under 35 U.S.C. §§102 and 103 are improper. Reversal of the rejections in this appeal is respectfully requested.

If necessary, please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 20-0782, and please credit any excess fees to the above referenced deposit account.

Respectfully submitted,

2/15/06



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CLAIMS APPENDIX

1. In a network comprising a plurality of router nodes connected in the network by communication links, a method of providing quality of service assurances for transmitting packets over a channel that transmits at at least a nominal bandwidth, the method comprising:

defining a plurality of classes, each of the classes representing an aggregate behavior of packets;

allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth; and

assuring each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth,

wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable.

2. The method of claim 1 wherein the step of assuring a minimum allocation to each of the classes comprises assigning a percentage to each of the classes that represents a minimum percentage of the available bandwidth that is allocated to that class.

3. The method of claim 1 wherein the minimum allocations assured to the classes are proportionally different than the nominal departure rates allocated to these classes.

4. The method of claim 1 further comprising establishing a drop precedence for each of the classes to determine a priority for dropping packets of that class.

5. The method of claim 1 wherein the nominal departure rate assigned to each of the classes by a given one of the router nodes is a percentage of a nominal bandwidth of an outgoing communication link of that router node.

6. The method of claim 1 wherein a given router node has a plurality of outgoing communication links and the nominal departure rate allocated to a given class is different for the different outgoing communication links.

7. The method of claim 1 wherein the nominal departure rate allocated to a given class is different for different router nodes.

8. The method of claim 1 wherein a given router node has a plurality of outgoing communication links and the nominal departure rate together with the assured minimum allocation allocated to a given class is different for the different outgoing communication links.

9. The method of claim 1 wherein the nominal departure rate together with the minimum allocation allocated to a given class is different for different router nodes.

10. The method of claim 1 further comprising dropping packets from queues to limit the delay at a given router node.

11. The method of claim 10 further comprising attaining the minimum allocations assured to each of the service classes by providing an alternate route for packets of service classes in accordance with the rate priorities assigned to the service classes.

12. The method of claim 1 wherein at least one of the communication links is a wireless link.

13. The method of claim 1 further comprising assigning scheduling priorities to the classes based on a criterion.

14. The method of claim 13 wherein the criterion is a delay that each class can tolerate.

15. – 16. (Cancelled)

17. In a network, a router node that supports differentiated services, the router node comprising:

a classifier defining a plurality of classes, each of the classes representing an aggregate behavior of packets;

an allocater allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of a channel that transmits at at least a nominal bandwidth is substantially operating at the nominal bandwidth; and

a rate prioritizer assigning each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth,

wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable.

18. The router node of claim 17 further comprising a plurality of outgoing communication links, and wherein the nominal departure rate allocated to a given class is different for different outgoing communication links.

19. The router node of claim 17 further comprising a plurality of outgoing communication links, and wherein the nominal departure rate together with the assured minimum allocation allocated to a given class is different for different outgoing communication links.

20. An article of manufacture having computer-readable program means embodied thereon for providing quality of service assurances for transmitting packets over a channel that transmits at at least a nominal bandwidth, the article comprising:

computer-readable means for defining a plurality of classes, each of the classes representing an aggregate behavior of packets;

computer-readable means for allocating to each of the classes a nominal departure rate at which the packets of that class are transmitted when an available bandwidth of the channel is substantially operating at the nominal bandwidth; and

computer-readable means for assuring each of the classes a minimum allocation of the available bandwidth for transmitting packets of that class if the available bandwidth of the channel is operating at less than the nominal bandwidth,

wherein at least one of: the nominal departure rate or the minimum allocation is dynamically changeable.

21. The method of claim 1, further comprising:

dynamically changing said at least one of the nominal departure rate and the minimum allocation in response to a change in a condition of at least one of said communication links.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None